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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/730,246	12/05/2000	Jathan D. Edwards	53868US02	7896

7590 05/20/2004

Attention: Eric D. Levinson
Imation Corp.
Legal Affairs
P.O. Box 64898
St. Paul, MN 55164-0898

EXAMINER


ANGEBRANNDT, MARTIN J

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 05/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/730,246	Applicant(s) EDWARDS, JATHAN D.	
	Examiner Martin J Angebranndt	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 36-55 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 36-55 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 1756

1. The response of the applicant has been read and given careful consideration. Responses to the arguments of the applicant are presented after the first rejection to which they are directed.

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 36-42 and 45-47 are rejected under 35 U.S.C. 102(b) as being fully anticipated by Sugimoto JP 01-023440 (aka JP 64-023440).

Sugimoto JP 01-023440 teaches with respect to figure 1, laser exposure of a resist, development, formation of a stamper and formation of a polycarbonate substrate using the stamper. The grooves formed by the laser exposure are wider than the remaining areas of resist as shown in figure 1c. On page 3, the groove formed on the photosensitive master is 1.1 microns wide and the pitch is 1.6 microns. (page 3, upper left column). $1.6 \text{ (pitch)} \div 1.1 \text{ (groove width)} = 1.45$, which is less than 1.6. Describing the prior art (figure 4), a first (4d, 4e) and second (4f, 4g) stamper are formed, and then the substrate (4h) is formed from the second stamper. The reproduction characteristics of the media are disclosed in the upper right hand column of page 3. Please note the resolution of the exposure (NA-0.93) on page 2 in the lower left column.

The claims are directed to the formation of the pattern in the photoresist of the master. The language concerning a replica is considered intended use until actively recited. The examiner notes that only grooves and lands need to be formed and that either conformation (direct or inverse) could be used as the substrate. With the width of the grooves being 1.1 microns and the thickness of the resist on the order of a micron or less, then examiner holds that the width of the substrate exposed is more than 0.8 microns.

The applicant is quite correct that the width of the groove and the spot size of the laser are not the same, but these are related. The arguments of the applicant fail to account for the use of defocusing of the laser beam in the reference (see page 4 of the translation describing the process conditions according to the invention). Among these is that only a single pass of the laser is disclosed, the 0.57 value for k assumed by the applicant does not apply between optical systems merely due to the use of similar lasers, the high laser power used (5.7 mW vs 3.0 mW), the use of defocusing and the sensitivity of the photoresist. The formula appearing on page 1 of the instant specification and relied upon by the applicant relates to the diffraction limit of the focus only for a particular system. It does not address defocused situations such as that used in the reference. The diameter of the beam will be larger than the groove formed in the resist due primarily to the sensitivity of the resist. The wings (edges of the (Gaussian) beam) will not have sufficient intensity to expose the resist and the width of the groove is likely measured at $\frac{1}{2}$ height, not the top. The top of the groove will be wider and the bottom narrower due to the approximately Gaussian intensity distribution of the laser beam (for gas lasers, such as argon ion and HeCd operating in TEM00 mode). Therefore the laser spot size is at least the width of the groove due to the single pass and due to the sensitivity of the resist and the lower intensity of the

laser at the edges of the beam, likely somewhat wider. In the reference the groove is 1.1 microns and the pitch is 1.6. Even assuming the best case for the applicant's argued position (the laser being the same width as the groove), the laser is 1.45 times the pitch of the tracking grooves, which meets the limitation of the claims. The problem with the current claims language is that it fails to account for duty cycles in the pitch that are less than 0.5 (ie. cases where the grooves and lands are different widths) and where the dimensions of the lands and grooves are relatively large.

With respect to the issue of intended use. The preamble is directed to "laser etching a photosensitive master to form a master pattern that is the inverse of a **desired replica pattern**", also such as pattern will have a track pitch less than 2 times the spot size of the laser. The process does not actively recite a step for producing the replica, only what it might be. In the case of optical recording media recording may be performed in the grooves and/or on the lands and either the same polarity image or the inverse would be useful. The applicant has not added the step of forming the replica, preferring to stop with the master. Therefore the examiner holds that the step of forming the replica is not required to be shown to meet the claim, but the master has to meet the structural limitation so that an inverse master meeting the limitation of the claims could be formed from it. Therefore this is considered an intended use limitation as the actual step of forming the inverse replica is not recited. With respect to the flatness, the examiner notes that the development of the resist is shown in the figure 1c to proceed down to the substrate surface, which is flat. The rejection stands.

In response to the amendments of 12/22/2003 and 03/04/2004, In the prior art, a single pass of the laser beam exposes the resist forms a groove approximately equal to the size of the

laser beam and the widths of the lands between the grooves are less than the the groove width and therefore the pitch (the sum of the width of the groove and an adjacent land) is less than twice the beam width. In a defocussed situation, the intensity profile is flattened and widened, but it is not clear how much this occurs in the prior art and precisely what the FWHM might be. It is likely to still be similar to the groove width, unless the sensitivity of the resist is extremely high or the beam very intense (so that the portion of the beam resulting in resist development is larger/wider than the FWHM). Contrary to the applicant's argued position, the examiner is not extending the width to the wings of the gaussian form (this would be absurd), but merely to the width which results in exposed and developed resist image. The examiner prefers a reasonable value for the width, rather than the more philosophical position asserted by the applicant. The examiner notes that the groove width divided by the pitch is clearly the determination used by the examiner for example on page 2 of the final office action, therefore the applicant's argument that the examiner assumes an infinite size to the beam is simply absurd. The applicant has stated that the groove width is entirely different from the spot size (at FWHM) on page 3 of the remarks, but fails to articulate how. The examiner points out that in JP 02-010536 (page marked 16 in the upper right), the $1/e^2$ spot size is disclosed as 0.5 microns and the resulting groove width is 0.3-0.7 microns. The variation is likely dependednet upon the relative sensitivity of the resist, amount of exposure, the agressiveness of the development process. Clearly, the size of the beam is related to the portion of the resist imaged. The same defocussing technique is shown in figure 1 of JP 02-244440 and the FWHM of the resist image (21, 12) seems to be equal to the portion of the gaussian beam with an intensity above $1/e^2$. *Currently, the claims rejected under this heading do not recite the process of forming the odd number of stamper(s) and using these*

*to form the optical recording medium substrate. The examiner recommends that the applicant consider including these and substantial limitations on the sizes (widths, depths) of the grooves, pitch and/or lands to reduce the issues and move toward patentable subject matter. The examiner directs the applicant to figure 1 of Nakamura et al. "High Density Recording for Magneto-optical disk drive", IEEE Trans. Magnetics, (03/1998) which shows wide land and wide groove media and thereby establishes that either have utility. This is in addition to the teachings of Kashiwagi et al. EP 0418897 and Folger et al. '978. The use of substrates with grooves and lands of differing widths allow recording in **either** land or groove areas and an increased numbers of tracks radially due to the reduction in the size of the feature where recording is not preformed. The areas where recording does not take place merely physically and thermally isolated the adjacent tracks from one another. See also Sasaki et al. '353 (1/42-49 and 2/63-3/5), Ohtomo et al. (figures 3,4a,4b and accompanying text.) and Arakawa et al. JP 08-306080 (translation attached). While the applicant is not explicitly claiming the ratio of the groove width to the pitch, the relationship of the beam and pitch recited clearly embraces this embodiment.*

5. Claims 36-42 and 45-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimoto JP 01-023440, in view of Kashiwagi et al. EP 0418897 and Folger et al. '978.

Kashiwagi et al. EP 0418897 teaches the size of the grooves is limited by the ability to decrease the spot diameter of the laser beam and that this is limited by the numerical aperture and the wavelength of the laser light (1/24-42). To reduce the size of the grooves, the photoresist is exposed and developed to produce a groove of a certain width (W_1) and then etching is performed to produce grooves of a smaller width (W_3) in an intermediate layer. (figures 1c &

1d). A stamper (9,10) is made from this surface and used to form a second stamper (11) and a third stamper (12), which is then used to produce a optical disk substrate with wide lands and a narrow groove.

Folger et al. '978 teaches the formation of optical devices (phase gratings) where the first and second generation copies are formed using a cast resin. (6/42-7/28 and 7/29-8/35) Subsequent replicas useful in stamping are formed through electrodeposition/electroforming and the metal separates easily from the plastic (8/60-61) The passivation of the nickel surface with dichromate to allow another nickel master to be formed thereon, but allowing for easy removal is disclosed. (8/36-9/5). Note that both odd and even duplicates are used to stamp the desired images. It is just a matter of polarity of the original relative to the desired article.

It would have been obvious to modify the process of Sugimoto JP 01-023440 by forming a second stamper and then the optical disk substrate to produce the high density optical recording media substrates of Kashiwagi et al. EP 0418897 without the need for the etching step with a reasonable expectation of success as the number of techniques is reduced and the teachings of Folger et al. '978 concerning the use of either odd or even numbered stampers to form substrate in the polymeric material.

The rejection stands for the reasons above without further comment.

6. Claims 36-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimoto JP 01-023440, in view of Kashiwagi et al. EP 0418897 and Folger et al. '978 combined with Daecher et al. '829.

Daecher et al. '829 teach the width and pitch of the spiral groove formed in the substrate may be 0.1-10 microns dependent upon the particular medium.

In addition to the basis provided above, the examiner holds that it would have been obvious to use modify the invention of Sugimoto JP 01-023440, in view of Kashiwagi et al. EP 0418897 and Folger et al. '978 for higher density media by decreasing the pitch of the media (thereby increasing the number of tracks and the amount of data able to be stored) by reducing the pitch within the ranges taught by Daecher et al. '829 to gain the advantage of increased storage capacity.

7. Claims 36-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugimoto JP 01-023440, in view of Kashiwagi et al. EP 0418897 and Folger et al. '978, Daecher et al. '829 and Horie et al. '539.


Horie et al. '539 teaches the use of an optical head of 0.55 NA (6/51) in optical recording.

It would have been obvious to modify the invention of Sugimoto JP 01-023440, in view of Kashiwagi et al. EP 0418897 and Folger et al. '978, Daecher et al. '829 by using known optical head such as that disclosed by Horie et al. '539 with a constant of 0.55 with a reasonable expectation of performing the exposure and forming a useful photoresist pattern.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Martin J Angebranndt whose telephone number is 571-272-1378. The examiner can normally be reached on Monday-Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Martin J. Angebranndt
Primary Examiner
Art Unit 1756

05/17/2004